

REMARKS

The examiner has objected to claims 4 and 8 as being improper multiple dependent claims. It is respectfully submitted that these claims are proper multiple dependent claims. Claim 4 depends from independent claim 1 and from non-multiple dependent claims 2 and 3. Thus, claim 4 is not dependent on another multiple dependent claim. Claim 8 likewise is not dependent on a multiple dependent claim. See MPEP §608.01(n).

Claims 1 and 4 which are the independent claims in this application have been amended to clarify that inspection for proper stitching requires forming in computer memory a reference image. The reference image is formed by superimposing two calculated dose distribution images of pattern elements, one from each side of the stitching boundary, to form a single dose distribution image. The ΔX or deviation along the boundary is determined, and the ΔY or deviation across the boundary and the dose intensity are assumed prior to the superposition of the two calculated images. The superimposed dose distribution image (reference image) is then compared to the image of two corresponding pattern elements at a stitching boundary obtained by electron lithography. A dose distribution image is an image that accounts for the blurring that takes place at the edges of an electron lithographic image due to backscattering as explained with reference to Fig. 3. A dose distribution image is represented by Fig. 8. The comparison (correlation) of the superimposed calculated image based on the measured ΔY and the obtained image enable the detection of the ΔY notwithstanding the blurring.

The examiner has rejected claims 1 to 8 under 35 U.S.C. § 102(b) as anticipated by Resor III, et al. U.S. Patent No. 4,769,680 (herein Resor). Reconsideration is respectfully requested.

Resor discloses a photolithography system that does not perform an inspection by forming a reference image and then comparing the reference image to an obtained image. Indeed, Resor does not form an image of the mask or reticule transferred to the substrate in order to check stitching. Resor discloses devices for calibrating the x-y position table on which the substrate is mounted and exposed and devices for calibrating the reticule and/or camera for projecting the reticule on the substrate. This, however, is not a system for inspecting the stitching of the exposed pattern image formed on the substrate. Because Resor is directed to optical lithography, it does not contemplate the blurring problem of electron lithography. Resor does not teach superposition of two dose distribution images for comparing to an obtained image. Resor does not teach that a superimposed image is formed after the ΔX offset along the boundary is determined. For at least these two reasons, Resor does not anticipate claims 1 to 8.

Contrary to the examiner's position, Resor does not detect deviation ΔX between stitched elements. The description at column 5, lines 10-25 is merely a description of how x and y axes of the substrate are compared to the x and y axes of the positioning stage when the substrate is repositioned on the stage. It further describes determination of the scale and orthogonality of the axes. This has nothing to do with measuring ΔX deviation between stitched elements.

Contrary to the examiner's position, Resor does not store two sets of data about images indicating dose distributions, etc. At column 4, lines 48 to 55, Resor merely describes that in the exposure system having two cameras, feedback from an intensity sensor for the lamp in each camera enables each camera to be matched. Data store by Resor is not "dose distribution data."

Contrary to the examiner's position, Resor does not disclose an image superposition means for shifting two dose distribution images to form a reference image. The examiner's supporting citation to column 6, lines 2-32, is a citation to the listing of the patent drawings.

Contrary to the examiner's position, Resor does not disclose an image comparator for taking the correlation between image data obtained for inspection and image data produced by the superimposing of two dose distribution images. The examiner's supporting citation to column 6, lines 2-32, is a citation to the listing of the patent drawings.

The examiner has rejected claims 1 to 8 under 35 U.S.C. § 102(e) as being anticipated by Hazama et al. U.S. Patent No. 6,583,854 (herein Hazama). Reconsideration is respectfully requested.

Hazama pertains to an apparatus for using photolithography to transfer mask images to a substrate (similar to Resor). The text portions of the Hamaza patent cited by the examiner relate to exposing the images and not to inspecting the stitched images. However, Hamaza, with reference to Figs. 25, 26, and 27 at columns 34 to 36, discloses an inspection apparatus and process for the inspection of the transferred mask. The inspection apparatus and method differs substantially from that claimed in this application. This is not surprising since the photolithography method does not contemplate the image blurring due to backscatter in electron lithography. Three inspection methods are disclosed at column 36 of Hazama; namely, searching for gaps in an image of a boundary (lines 19 to 23), seeking fixed pitch between identical elements in adjacent transferred masks (lines 26 to 33) and comparing two digitized unblurred patterns taken of counterpart pattern structures from different positions on the mask device (lines 34 to 58). Hamaza does not teach superposition of two dose distribution images for comparing to an obtained image. Hamaza does not teach that a superimposed image is formed after the ΔX offset along the boundary is determined. For at least these two reasons, Hamaza does not anticipate claims 1 to 8.

Contrary to the examiner's position, Hamaza does not disclose storing two set of data about images indicating dose distributions in memory, said dose distributions being calculated by a simulation method, etc. Nothing at column 3, lines 3 to 18 suggest this. The cited lines are directed to an exposure process for the formation of a substrate and not an inspection process in which superimposed dose distribution images are stored in computer memory. At column 36, Hamaza discloses storing two sets of data about images for comparison, but these are two obtained images. One is not a calculated image. The images are represented by "0" or "1" for each pixel (see column 36, lines 45 to 58) and, hence, are not dose distribution images indicative of blurring.

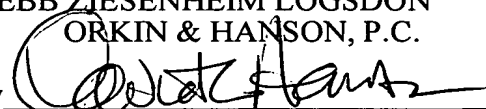
Contrary to the examiner's position, Hamaza does not teach forming a calculated superimposed dose distribution shifted by ΔX to form a basis of comparing to an obtained image. The two images referred to in column 36 as being superimposed are two observed counterpart images taken from different positions on the mask. How the images are positioned relative to each other and their respective datum is not explained. It is clear that they are not different images from across a stitching boundary, but identical or counterpart images from different locations on the repeating mask pattern.

In view of the foregoing amendments and remarks, it is urged this case is now in condition for allowance.

Respectfully submitted,

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